DECLARATION

I, Yuichiro SHIMIZU, of SHIGA INTERNATIONAL PATENT OFFICE, GranTokyo South Tower, 1-9-2, Marunouchi, Chiyoda-ku, Tokyo, Japan, understand both English and Japanese, am the translator of the English document attached, and do hereby declare and state that the attached English document contains an accurate translation of the official certified copy of Japanese Unexamined Patent Application, First Publication No. S63-80021 and that all statements made herein are true to the best of my knowledge.

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(54) Title of the Invention COOLING CONSTRUCTION OF TRANSITION PIECE OF GAS TUBIN COMBUSTOR

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Specification

1. Title of the Invention

COOLING CONSTRUCTION OF TRANSITION PIECE OF GAS TUBIN COMBUSTOR

2. Claims

1. A cooling construction of a transition piece of a gas turbine combustor comprising a cooling cover with a cooling-air passing hole which is fitted to the outside of the transition piece and an air gap which is provided between the transition piece and the cooling cover, so as to cool the transition piece of the gas turbine combustor for guiding a high-temperature and high-pressure combustion product gas generated in the combustor to the gas turbine, wherein

a shield plate of which the length in an axial direction is smaller than that of the cooling cover is provided, and wherein

one end of the shield plate is fixed to the cooling cover and the shield plate covers a part of the outer circumferential surface of the cooling cover.

2. The cooling construction of a transition piece of a gas turbine combustor according to Claim 1, wherein one end of the cylindrical cooling cover is fixed to the transition piece and the other end thereof is slidably supported by the transition piece in the axial direction.

3. The cooling construction of a transition piece of a gas turbine combustor according to Claim 1 or 2, wherein a region in which the shield plate covers the cooling cover is adjacent to or includes a position where the cooling cover is fixed to the transition piece.

3. Detailed Description of the Invention

(Industrial Applicability)

The present invention relates to a gas turbine combustor, and more particularly, to a construction suitable for reducing thermal stress of an impingement cooling cover of a transition piece.

(Background Art)

A transition piece of a counterflow can-type gas turbine combustor has a configuration in which a combustion gas generated in an inner pipe flows to the inside thereof and an air supplied from a compressor to the inner pipe flows to the outer circumference thereof, and Japanese Examined Patent Application, Second Publication No. S54-11443 (Fig. 2) discloses a cooling technique in which a cooling cover 2 having a small hole (cooling hole) 4 is fixed to the entire circumference at a part of the transition piece 1 by welding is provided for a case where a wall surface temperature

exceeds an allowable value.

However, it is not considered how a thermal stress of the cooling cover 2 caused by a thermal expansion amount can be reduced.

(Problem to be solved with the Invention)

The impingement cooling structure of the transition piece according to the known technique (the cooling construction of the transition piece in which a cylindrical cooling cover with the cooling-air passing hole is fitted to the outside of the transition piece, and an air gap is provided between the cooling cover and the transition piece) can obtain a high cooling performance by emitting an air from the small hole (cooling hole) 4 provided in the cooling cover 2 to impinge against the transition piece 1, which is a target for cooling, and allows the air to flow from an exhaust hole 5 on the transition piece wall surface to the combustion gas. Accordingly, the cooling cover 2 is cooled by an air flowing to the vicinity thereof and an air flowing through the cooling hole 4, so that the temperature thereof becomes close to a temperature of an air in the periphery thereof, and thus a temperature difference between the transition piece 1 and the cooling cover 2 becomes in the range from 300 to 400°C. The temperature difference does not only cause a thermal stress due to a thermal expansion difference in the longitudinal direction but also causes a thermal stress due to a thermal expansion difference in the radius direction. As shown in Fig. 3, a thermal stress is determined with a temperature difference ΔT and a distance b in the longitudinal direction in which the temperature difference ΔT occurs, and thus when •b is constant, the thermal stress becomes small as ΔT becomes small. In the known structure shown in Fig. 2, it is necessary to set the distance b to be large to a certain degree (for example, 30mm or more) in order to restrict the thermal stress within an allowable value. However, when the distance b is set to be large, a problem arises in that the cooling function of the transition piece is reduced.

The invention is contrived in consideration of the above-described problems, and an objection of the invention is to provide a cooling construction of a transition piece that is designed to arbitrarily set a distance between the maximum temperature point and the minimum temperature point of the cooling cover, and to thereby control a thermal stress of the cooling cover.

(Means for solving the Problem)

The above-described object is achieved by restricting a heat exchange between the outer circumferential surface of the cooling cover and an air supplied to the inner pipe.

Based on the above-described principle, as a specific configuration for controlling a thermal stress of the transition piece cooling cover, the invention is characterized in that a cooling cover with a cooling-air passing hole is fitted to the

outside of the transition piece, and a shield plate which is applied to a cooling construction of a transition piece having an air gap provided between the transition piece and the cooling cover and of which the length in an axial direction is smaller than that of the cooling cover is provided in order to cool a gas turbine combustor transition piece for guiding a high-temperature and high-pressure combustion product gas generated in the combustor to a turbine, wherein one end of the shield plate is fixed to the cooling cover, and wherein the shield plate covers a part of the outer circumferential surface of the cooling cover.

(Effect)

According to the above-described configuration, since a part of the cooling cover is covered with a shield plate, air supplied to the inner pipe of the combustor cannot flow along the cooling cover, and thus a thermal conductivity of the outer surface of the cooling cover becomes low. As a result, the dimension and shape of the shield plate are arbitrarily set to thereby control a temperature gradient of the cooling cover.

(Embodiment)

Hereinafter, an embodiment of the present invention will be described with reference to Fig. 1. Inside a transition piece 1 of a gas turbine combustor, an exhaust gas generated in an inner pipe, which is not described in the drawing, flows to an exit 6. The size of an inner passage of the transition piece 1 becomes small toward the exit 6, and a cooling cover 2 having a cooling hole 4 is mounted to the outer circumference of the exit at a predetermined distance from the transition piece 1. One end of the cooling cover 2 is joined (7), and the other end thereof is inserted into a groove formed at the transition piece 1 in the insertion portion 9. A shield plate 3 is joined to a position 8 away from the join portion 7 between the cooling cover 2 and the transition piece 1 by b so as to further surround the outer circumference of the cooling cover 2, and covers a portion between the join portions 7 and 8 of the cooling cover 2. An exhaust hole 5 is formed in a wall surface of the transition piece 1 so as to communicate a space formed by the transition piece 1 and the cooling cover 2 with the inner portion of the transition piece.

The cooling cover 2 receives a heat in terms of a thermal conduction and a thermal radiation from the transition piece 1, but emits a heat in terms of a thermal conduction by an air flowing to the inner surface and the outer surface, a thermal conduction by an air flowing to the cooling hole 4, and a thermal radiation to the outer circumference. In the cooling cover for impingement-cooling the transition piece 1 of the combustor, a heat emission by an air flowing to the outer surface is comparatively large, and thus when the shield plate 3 is disposed in the outer surface of the cooling cover 2 to remove a flow along the cooling cover, according to the

experiment of the inventor, a thermal radiation amount of the cooling cover 2 can be set to 1/2, and a wall surface temperature between the join portions 7 and 8 of the cooling cover 2 surrounded by the shield plate 3 becomes larger than that of the join portion 8 and a wall surface temperature of the cooling cover close to the exit 6.

Fig. 4 illustrates another embodiment different from the above-described embodiment. In this embodiment, a connection base 10 for joining the cooling cover 2 is provided, and the cooling cover 2 and the shield plate 3 are joined to the connection base 10. With such a configuration, it is possible to obtain the same advantage as that of the above-described embodiment.

Fig. 5 illustrates still another embodiment. The insertion portion 9 is provided in the connection base 10 joined to the transition piece and is inserted into the cooling cover 2, the other end of the cooling cover 2 is joined to the join portion 7 in the vicinity of the exit 6 of the transition piece, and the shield plate 3 is directly joined to the transition piece at the outer circumference thereof.

In addition to the structure in which a space is formed between the cooling cover 2 and the shield plate 3 to reduce an air flow rate in the space, like the embodiment shown in Fig. 6, the front end of the shield plate 3' may be bended to be close to the cooling cover 2 and an air hole 11 may be provided in the shield plate 3' to allow only an air flowing to the cooling hole 4 to flow. With the embodiments, it is possible to obtain the same advantage as that of the above-described embodiment in the same manner.

(Advantage of the Invention)

According to the invention, since a distance between the maximum temperature point and the minimum temperature point of the cooling cover 2 can be arbitrarily set, it is advantageous in that the thermal stress of the cooling cover can be controlled.

4. Brief Description of the Drawings

Fig. 1 is a longitudinal sectional diagram illustrating a transition piece of a gas turbine combustor according to an embodiment of the invention, Fig. 2 is a longitudinal sectional diagram illustrating an impingement cooling structure of a transition piece of a gas turbine combustor according to a known example, and Fig. 3 is a graph illustrating a thermal stress characteristic in the case where one end of a cylindrical cover is heated so that a temperature gradient becomes constant. Figs. 4 to 6 are longitudinal sectional diagrams illustrating other embodiments different from the above-described embodiments, respectively.

1: TRANSITION PIECE

2: COOLING COVER

3, 3': SHIELD PLATE
4: COOLING HOLE
5: EXHAUST HOLE
6: EXIT

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[Document Type] DRAWINGS

[Fig. 1]

1: TRANSITION PIECE
3: SHIELD PLATE
2: COOLING COVER
4: COOLING HOLE
6: EXIT
9: INSERTION PORTION
5: EXHAUST HOLE
8: JOINED PORTION
7: JOINED PORTION

[Fig. 2]

1: TRANSITION PIECE
4: SMALL HOLE
2: COOLING COVER
5: EXHAUST HOLE

[Fig. 3]

STRESS
TEMPERATURE DIFFERENCE
ALLOWABLE VALUE

[Fig. 4]

1: TRANSITION PIECE
10: CONNECTION BASE
3: SHIELD PLATE
4: COOLING HOLE
2: COOLING COVER
9: INSERTION PORTION
6: EXIT
5: EXHAUST HOLE
7: JOINED PORTION

[Fig. 5]

10: CONNECTION BASE
2: COOLING COVER
7: JOINED PORTION

[Fig. 6]

9: INSERTION PORTION

2: COOLING COVER

4: COOLING HOLE

11: AIR HOLE

3': SHIELD PLATE